

WASHINGTON DEPARTMENT OF ECOLOGY
ENVIRONMENTAL ASSESSMENT PROGRAM
FRESHWATER MONITORING UNIT
STREAM DISCHARGE TECHNICAL NOTES

STATION ID: 19E060
STATION NAME: Deep Creek
WATER YEAR: 2009
AUTHOR: Casey Clishe

Introduction

Watershed Description

The Deep Creek watershed contains one of three stations in the Intensively Monitored Watersheds (IMW) project Strait of Juan de Fuca complex. The stream is approximately 7.9 miles long, the basin area is 17.3 square miles. Watershed elevations range from sea level to 3,020 feet. Precipitation falls primarily as rain between October and May, averaging 86 inches annually. Crescent formation volcanic rocks in the upper watershed, and marine sedimentary rock overlain by terraces of glacial deposits in the lower watershed, coarsely define the complex geology of the watershed. The primary land use for the last century has been commercial forestry. Three vegetation zones define the basin--Sitka spruce in the valley bottoms, Western hemlock in the low to mid elevations, and Silver fir in the headwaters. The fish species present include Coho salmon, chum salmon, steelhead or rainbow trout, cutthroat trout, Pacific lamprey, western brook lamprey, torrent scuplin, and reticulate sculpin.

Gage Location

The gaging station for Deep Creek is located in Clallam County, Washington, approximately 27 miles west of Port Angeles. Deep Creek is a tributary to the Strait of Juan de Fuca. The gage, placed on the left bank, is on the downstream side of the Highway 112 bridge at approximately river mile 0.2. The stage record is tidally influenced. Tidal spikes in the stage record are removed.

Table 1.

Drainage Area (square miles)	17.3
Latitude (degrees, minutes, seconds)	48 10 21 N
Longitude (degrees, minutes, seconds)	124 01 36 W

Discharge

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	50
Median Annual Discharge (cfs)	31
Maximum Daily Mean Discharge (cfs)	679
Minimum Daily Mean Discharge (cfs)	1.4
Maximum Instantaneous Discharge (cfs)	904
Minimum Instantaneous Discharge (cfs)	1.4
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	115
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	3.4
Number of Days Discharge is Greater Than Range of Ratings	3
Number of Days Discharge is Less Than Range of Ratings	28

Note: Statistics displayed in Table 2 may not include values in which the predicted discharge exceeds the range of ratings.

Narrative

Due to rating curve exceedances, three of the highest days in the predicted discharge record were excluded from some statistics in Table 2. The mean annual discharge, median annual discharge, maximum daily mean discharge, and maximum instantaneous discharge in Table 2 are less than the actual values. 28 days in October 2008 recorded stage values that exceeded the low end of the rating curve used to predict discharge. The actual daily discharge values during this time are less than the reported values. Discharge elevated above baseflow in early October 2008 due to a series of small precipitation events. The first two significant storm events of the year occurred in November 2008. These events were followed by a relatively dry period until a large winter storm dramatically increased discharge beginning on January 6, 2009. This event was again followed by a relatively long dry period until a series of small to moderate storms impacted the basin from March 2009 through mid-May. A steady, slow decline to baseflow conditions began in mid-May. Baseflow was reached by late July.

Error Analysis

Table 3. Error Analysis Summary.

Logger Drift Error (% of discharge)	2.5
Weighted Rating Error (% of discharge)	9.0
Total Potential Error (% of discharge)	11.5

Rating Table(s)

Table 4. Rating Table Summary

Rating Table No.	7	601	701
Period of Ratings	10/01-11/05	10/01-11/15	11/05-05/07
Range of Ratings (cfs)	0-988	17-988	0-988
No. of Defining Measurements	19	3	19
Rating Error (%)	9.2	9.7	9.2

Rating Table No.	8		
Period of Ratings	05/02-09/30		
Range of Ratings (cfs)	4.2-988		
No. of Defining Measurements	16		
Rating Error (%)	8.6		

Rating Table No.			
Period of Ratings			
Range of Ratings (cfs)			
No. of Defining Measurements			
Rating Error (%)			

Narrative

Water year (WY) 2009 was somewhat unusual because a long transition period between two ratings, 7 and 601, covered the beginning of the water year. A very brief shift to rating 601, a replica of rating 6, occurred in November 2008. During two moderately large storm events in November, the control scoured slightly and the rating quickly shifted back to 701, a replica of rating 7. Somewhat surprisingly, a small event in late May 2009 further scoured the control resulting in a shift to a new rating, (Table 8). Table 8 predicted discharge for the remainder of WY2009.

Stage Record

Table 5. Stage Record Summary

Minimum Recorded Stage (feet)	0.58
Maximum Recorded Stage (feet)	8.58
Range of Recorded Stage (feet)	8.00
Number of Un-Reported Days	3
Number of Days Qualified as Estimates	0
Number of Days Qualified as Unreliable Estimates	0

Narrative

The stage record for WY2009 was continuous and complete. 3 days were excluded from discharge record predictions because all or some of those days recorded stage values which exceeded rating curve thresholds. A seven-day gap in the stage record caused by failing equipment was filled using regressed, well-correlated stage data from an adjacent station. Discrepancies between the logged record and the primary gage index observations were reconciled using a filter adjustment method as well as an automated data shift procedure. A very large storm event occurred in January 2009. Frequent tidal spikes in the stage record were manually edited.

Modeled Discharge

Table 6. Model Summary

Model Type (Slope conveyance, other, none)	none
Range of Modeled Stage (feet)	
Range of Modeled Discharge (cfs)	
Valid Period for Model	
Model Confidence	

Surveys

Table 7. Survey Type and Date (station, cross section, longitudinal)

Type	Date

Activities Completed

An MS5 Hydrolab was installed on September 30, 2009, for continuous monitoring of dissolved oxygen and conductivity.